XDS

Xerox Data Systems

Front

XDS Model 7580
Graphic Display Unit

1970

The XDS Model 7580 Graphic Display Unit is a cathode-ray-tube (CRT) display device for use with Sigma 5 and Sigma 7 computers. It permits computer output data to be displayed dynamically in a graphic form that is convenient and timely for the operator.

Computer-controlled CRT display units, such as the Model 7580, are especially useful in situations where human judgement must be applied to the data and where a human response to the data must be fed back to the computer in real time. This type of display and response is frequently used to vary experimental parameters and thus assure that a computer-controlled experiment is more efficiently executed. The fast response time of a CRT display — coupled with its ability to feed back information to the computer via a light gun, keyboard, or function keys — enhances man-machine communication in many on-line, real-time applications.

DESCRIPTION

The Model 7580 Graphic Display Unit is physically divided into two parts: a display console and primary controller. The display console is a free-standing unit connected by cable to the primary controller. The primary controller is housed in a standard Sigma I/O cabinet.

Primary Controller □ The primary controller controls all data flow between the display buffer (in the Sigma memory) and the display console. Because the primary controller connects directly to a Sigma memory port, the data stored in memory refreshes the display automatically without the need for CPU intervention. Branch instructions within the display data allow the display to be changed within microseconds without requiring data to be moved from one memory location to another.

The primary controller offers a number of features that contribute to the graphic display's versatility and ease of use:

□ Absolute or relative coordinates to permit simplified display manipulation.

□ Up to three sets of coordinates packed per data word for maximum memory utilization.

□ Automatic blinking of any displayed item to draw operator's attention to specific areas of the display.

□ Inhibition of light-gun sensing for selected portions of the displayed data to allow use of non-sensed "background" information.

□ Two levels of intensification.

□ Automatic refresh with no CPU intervention.

□ Requirements for program intervention automatically linked through priority interrupt levels.

□ Subroutining for use when the same information is repeated in different screen positions.

□ Error checking for memory parity errors, illegal attempts to access protected portions of memory, and screen overflow.

Display Console □ Functional subsystems housed in the display console are the analog subsystem containing the electronics needed to control movement of the electron beam in the CRT; an alphanumeric keyboard that allows the operator to communicate via alphanumeric characters with the central processing unit (CPU); function keys and action buttons that allow the operator to rapidly specify functions to be performed; and a light gun that allows the operator to feed back positional data to the
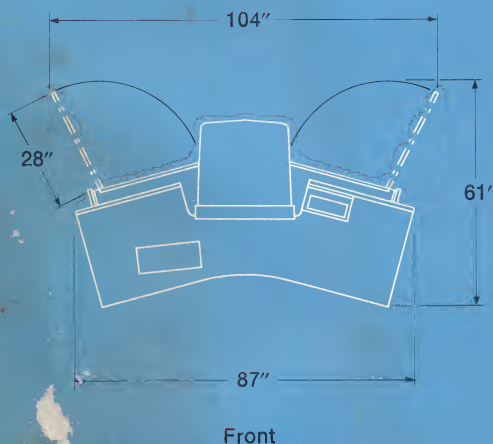
CPU or to identify a specific displayed item to which he is pointing.

The display generators consist of two vector generators, one character generator (three sizes), one dot generator, and one raster generator.

The two vector generators permit long and short vectors — with maximum coordinate lengths of 10 inches (full screen) and ¼ inch, respectively — to be drawn. Short vectors are drawn in 6 μsec, and long vectors are drawn in 41 μsec.

The character generator permits 64 characters to be generated in three sizes — approximately $\frac{3}{32}$ inch, $\frac{3}{16}$ inch, and $\frac{3}{8}$ inch high. Characters can be positioned randomly or in adjacent positions to form horizontally placed character combinations. Character drawing time is directly proportional to the size of characters, thereby providing an undistorted, constant-intensity alphanumeric display.

The dot generator allows dots to be plotted on the screen at speeds of 9 or 15 μsec per point, depending on the separation of dots. A raster generator allows the unit to detect the position of the light gun when the gun is pointed at unlighted areas of the display screen, eliminating the need for core-consuming tracking algorithms.

The nominal display area of the 21-inch CRT is 10 inches square. This viewing area accommodates 1024 divisions along both the X and Y axes. Point resolution in the viewing area is approximately 0.01 inch.

The alphanumeric keyboard allows input of the entire set of 64 displayable characters. It also contains five special cursor-motion keys. The function keyboard consists of 16 programmable function keys plus four interrupt-generating keys.

The light gun consists of a photomultiplier and associated control electronics. A convenient finger switch permits the light gun to respond to light radiation emitted from the face of the CRT. When activated, the light gun detects light from the CRT inside an area defined by a circle of light projected from the light gun onto the CRT faceplate.

Graphic Display Library □ The 7580 Graphic Display Unit is fully software supported. The Graphic Display Library (GDL-1) is a set of subroutines for controlling the 7580 Graphic Display Console, and for constructing, manipulating and filing images to be displayed.

GDL-1 permits programs to make full use of the features of the 7580 without using restrictive methods or obscuring the device features. GDL-1 is useful either for direct processing of images or for constructing higher-level display-process-systems.

The structure of GDL-1 allows the user to link elemental *blocks* together to form *lists* which may, in turn, be part of a larger list. This makes possible organization of simple routines into complex structures which reflect the high degree of organization in graphic images.

The calling sequences in GDL-1 permit subroutines to be called from programs written in Symbol, Meta-Symbol, or FORTRAN.

Since the 7580 is ported directly to memory, GDL-1 takes maximum advantage of this feature, permitting display commands to reside in various portions of memory. This feature also facilitates dynamic changes in display images.

GDL-1 is a reentrant, resident library in RBM or BPM for use by one or more foreground programs.

SPECIFICATIONS

CRT Characteristics	
CRT Size	21 in. (outside diameter)
Display Area	10 in. by 10 in.
Deflection Method	Electromagnetic
Focusing Method	Electrostatic
Screen Color	Green
Phosphor Type	P31
Stability	±2%
Repeatability	±0.5%
Operating Characteristics	
Vector Generator	
Short	0.16 in. coordinates (max.)
Long	10.0 in. coordinates (max.)
Character Generator	Stroke
Character Size	$\frac{3}{32}$ in., $\frac{3}{16}$ in., and $\frac{3}{8}$ in. high
Raster Count	1024 points by 1024 points (total of 1,048,576 points)
Raster Interval	0.01 in. by 0.01 in. (approx.)
Spot Diameter	0.02 in.
Display Speeds	
Points Spaced Less than ½ in.	9 μsec
Points Spaced Greater than ½ in.	15 μsec
Vectors Shorter than ¼ in.	6 μsec
Vectors Longer than ¼ in.	41 μsec
Character Generator	65 to 73 μsec per $\frac{3}{32}$-inch character
Fully Software Supported	
Environmental Characteristics	
Temperature	50°F to 104°F
Humidity	10% to 90%
Power Requirements	115v ac ±10%, 60 cps ±2 cps, 20 amp
Cable Length	
Controller to Console	75 ft (max.)
Physical Dimensions (Console)	
Width	90 in.
Depth	
Over-All	51 in.
Desk Top	17 in.
Height	
Over-All	53 in.
Desk Top	29 in.
Weight	550 lb (approx.)